

Effect of welding variables on mechanical properties of low carbon steel welded joint

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ABSTRACT

This paper discussed the effect of welding variables on the mechanical properties of welded 10 mm thick low carbon steel plate, welded using the Shielded Metal Arc Welding (SMAW) method. Welding current, arc voltage, welding speed and electrode diameter were the investigated welding parameters. The welded samples were cut and machined to standard configurations for tensile, impact toughness, and hardness tests. The results showed that the selected welding parameters had significant effects on the mechanical properties of the welded samples. Increases in the arc voltage and welding current resulted in increased hardness and decrease in yield strength, tensile strength and impact toughness. Increasing the welding speed from 40-66.67 mm/min caused an increase in the hardness characteristic of the welded samples. Initial decrease in tensile and yield strengths were observed which thereafter increased as the welding speed increased. An electrode diameter of 2.5 mm provided the best combination of mechanical properties when compared to the as received samples. This behaviour was attributed to the fact that increased current and voltage meant increased heat input which could create room for defect formation, thus the observed reduced mechanical properties.

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ARTICLE INFO

Keywords:
Welding
Low carbon steel
Welding variables
Mechanical properties

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Article history:
Received 18 September 2014
Revised 3 November 2014
Accepted 10 November 2014

1. Introduction

Steel is an important engineering material. It has found applications in many areas such as vehicle parts, truck bed floors, automobile doors, domestic appliances etc. It is capable of presenting economically a very wide range of mechanical and other properties.

Traditionally mechanical components has been joined through fasteners, rivet joints etc. In order to reduce time for manufacturing, weight reduction and improvement in mechanical properties, welding process is usually adopted. Today, a variety of different welding processes are available, such that welding is extensively used as a fabrication process for joining materials in a wide range of compositions, part shapes and sizes. Welding is an important joining process because of high joint efficiency, simple set up, flexibility and low fabrication costs [1]. Welding is an efficient, dependable and economical process.

Welded joints are finding applications in critical components where failures are catastrophe. Hence, inspection methods and adherence to acceptable standards are increasing. These acceptance standards represent the minimum weld quality which is based upon test of welded specimen containing some discontinuities. Welding involves a wide range of variables such as time, temperature, electrode, pulse frequency, power input and welding speed that influence the

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